Maryland Space Grant Consortium
Lead Institution: The Johns Hopkins University
Director: Dr. Richard Conn Henry
Telephone Number: 410-516-7350
Consortium URL: http://md.spacegrant.org
Grant Number: NNX10AM47H

PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The Maryland Space Grant Consortium is a Designated Consortium funded at a level of $575,000 for fiscal year 2013.

PROGRAM GOALS

Consortium Goals and SMART Objectives from your 2010 base proposal and budget (or as amended in subsequent submissions)

FELLOWSHIPS AND SCHOLARSHIPS

GOAL I: To offer financial support to those higher education students enrolled in Maryland Institutions that wish to pursue a career in space-related STEM fields. Objective #1: The MDSG Scholarship Committee will continue to recruit qualified students for scholarships among the seven degree-granting institutions in the consortium, *viz*., JHU, MSU, UMCP, TU, UMES, UMBC, Capitol College and HCC. Objective #2: The Scholarship Committee will continue to emphasize the recruitment of students from groups underrepresented in STEM disciplines. Objective #3: Continue to use the MDSGC Observatory, which is located on the roof of the Bloomberg Center for Physics & Astronomy on the Homewood campus of JHU, for student training and public outreach.

HIGHER EDUCATION

GOAL II: Provide Higher education students with opportunities to enhance their education in STEM areas and to promote their entry into aerospace related disciplines. Programs that provide relevant hands-on experience will be given high priority. Objective #1: Continue to support and enhance the MDSGC Balloon Payload Program (BPP) that provides students with access to near-space. Objective #2: Provide strong

support to internships programs for undergraduate and graduate students on an ongoing basis, either through direct funding or through partnerships with organizations such as GSFC. Objective #3: Support a portfolio of programs that recruits students to STEM related studies and retains their interest to the point that it eventually carries over into employment in STEM careers in general, and especially careers needed by NASA and the aerospace community. Objective #4: Continue to develop MDSGC capabilities and procedures to conduct longitudinal tracking of students who have received significant support from MDSGC, in order to determine the efficacy of our programs.

RESEARCH INFRASTRUCTURE

GOAL III: Support projects that provide opportunities for students to participate in aerospace-related research. Objective #1: Provide funding for programs that directly support students in gaining aerospace-related research experience. Objective #2: Ensure that research opportunities are made available to a diverse group of highly qualified students.

PRE-COLLEGE

GOAL IV: Support programs that provide substantive training to Maryland teachers that allow them to incorporate NASA-related content into effective teaching strategies. Objective #1: Facilitate the delivery of training that develops teacher's skills in the use of, and access to, earth and space science related data and discoveries, which will then inspire students to pursue careers in science, technology, engineering, and mathematics (STEM). Objective #2: Provide additional opportunities beyond the current earth and space science certification program for providing current content knowledge to in-service and pre-service teachers. Objective #3: Support programs that provide for hands-on, aerospace-related activities for middle school students.

INFORMAL SCIENCE

GOAL V: Increase the content knowledge of Maryland educators through training in informal science venues.

PROGRAM/PROJECT BENEFIT TO OUTCOME (1,2, & 3)

Provide concise, meaningful highlights or anecdotes (no more than three) that are directly related to work completed in 2013, highlighting student and/or project accomplishments. Specify alignment to an Outcome.

Outcome 1: The MDSGC Balloon Payload Program (BPP) has continued to thrive and grow. During 2013 an additional affiliate, Capitol College, joined the program and began participating in launches. In addition, Professor Yacob Astatke, who had led the Morgan State University part of the BPP, was awarded the 2013 Distinguished Teaching Award from the American Society for Engineering Education. One of the items cited in his award was his outstanding leadership of the MDSGC BPP at Morgan State.

Outcome 1: A quote provided by a MDSGC student: "The financial assistance by itself relieves a huge burden from me and my family, but more than that I have been provided numerous opportunities through this program that I would not otherwise

have had the chance to participate in. Some highlights include the winter student leadership retreat, which is a great way for me to both network with my peers as well as interact with potential employers and polish up my resume and interview skills. Through the events provided by this program, my interest in the aerospace field greatly increased, and because of this and the skills I have developed through the clinics, I have been able to have 2 aerospace related internships for the past 2 years (at NASA and ATK). Along that same line, I very much appreciated the opportunity to speak at last year's Meet and Greet, as it gave me the chance to practice my public speaking skills as well as to help inform my fellow students of the many job and internship opportunities there are available for them. (Zachary Hutcheson - on 09/30/13, 2011 Space Grant Scholarship, 2012 Lunar & Planetary Science Academy, 2012 Space Grant Scholarship, 2013 Space Grant Scholarship, ATK Elkton - Flight Software Intern."

The Meet and Greet referred to by the student is our annual meeting of all of our scholarship recipients. The students are able to network with each other and we always provide engaging presentations from recent participants in Space Grant Programs, as well as describing "the next steps" to take.

Outcome 2: MDSGC responded to the Cooperative Agreement Notice for Space Grant Innovative Pilot in STEM Education. We were successful in this very competitive opportunity and received a two-year grant for $5000,000. The proposal resulted from the collective efforts of the MDSGC affiliates, who pooled resources and innovative thinking to produce a winning proposal. Lessons learned from successful programs that supported specific goals at each campus were used to craft a comprehensive program that focused on retention of STEM majors in their first two years of college. One of the models that contributed to the thinking involved our Summer Student Exchange Program. The Principal Investigator for the program is located at Morgan State University, and four other affiliates (UMCP, UMES, Capitol College, and UMBC) have a substantial role in the program. An essential part of the program is to introduce students early to research with hands-on experience. The program is underway and has started its first cohort of students.

PROGRAM ACCOMPLISHMENTS

Refer directly to the consortium goals and SMART objectives in your 2010 base proposal when describing your accomplishments.

Outcome 1: *Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals:* (Discussion of achievements and progress related to your Fellowship/Scholarship, Higher Education and Research Infrastructure programs). *(Employ and Educate)*

26 students took next step in FY13 (SG participation supported from FY06-FY13 funds)

- 4 are pursuing advanced degrees in STEM disciplines
- 1 accepted a STEM position at a NASA contractor
- 16 accepted STEM positions in industry
- 3 accepted STEM positions in academia

- 2 went on to positions in non-STEM disciplines

Explicitly addressing Objective #1 of Goal I, the MDSGC Scholarship Committee awarded scholarships to students with majors in STEM fields that relate to aerospace workforce needs. These scholarships were awarded at affiliate institutions of MDSGC. In all, 36 students were awarded scholarships in this program. Of the 36 students, 8 (22%) were female and 21 (58%) were underrepresented minorities. Additional fellowship/scholarship awards were made through competitive programs, including summer internships. A total of 44 students received fellowship and scholarship funds. Of these 44 students, 11 (25%) were female and 26 (59%) were underrepresented minorities.

Supporting Goal I, Objective 3, MDSGC has continued to operate the MDSGC Observatory that is housed on the roof of the Physics & Astronomy building at Johns Hopkins University. We support a graduate student who serves as the Observatory Technician and who trains students in the use of the telescope. During the past year, 26 students (22 undergraduates and 4 graduate students) were trained in the use of the telescope. Once they have received sufficient training, the students may schedule the telescope for observing projects of their own. This year 7 of the 22 students trained were female and 3 were from underrepresented minorities. The telescope is open to the public every Friday night, and this gives the graduate student experience in public outreach. The Observatory is also open in conjunction with the monthly public lecture held across the street at the Space Telescope Science Institute. During this reporting period 1336 members of the public visited the Observatory and looked through the telescope.

Supporting Goal II, Objective #1, we continued and expanded the Balloon Payload Program (BPP). In addition to our ongoing programs at UMCP and Morgan State we added Capitol College to the program this year. In addition, the Naval Academy has begun to prepare launches with minor support from MDSGC. This year saw the transition to a new student manager. MDSGC funded this position for a graduate student at UMCP this past year, and she has since graduated and has begun work at JPL. 30 students had direct involvement with the program at UMCP, while an additional 100 were indirect participants. The program at UMCP is led by the PI for the BPP, Dr. Mary Bowden, and she involved 6 additional faculty as participants. The program at Capitol College had 6 students directly involved, and they were mentored by 3 faculty, including the Lead, Dr. Angela Walters. A newly revised course was created at Capitol College to implement the BPP activity. Payloads from UMCP, Morgan State, and Capitol College were successfully launched and recovered.

Supporting Goal II, Objective 2, the Student Exchange Program was again a success this past summer. Two students each from the University of Maryland Eastern Shore, University of Maryland College Park, and Morgan State University participated. They each worked with a mentor on a NASA-related engineering research project. The applications of these research projects spanned a wide range of topics, including smart grid power measurement, implementation of system engineering in software defined radio, remote sensing for precision agriculture, robotic platforms for water quality data

monitoring, lunar vehicle suspension testing, and high energy plume impingement on spacecraft systems. A student research seminar was held during the summer for the students to present their work, and one student gave a presentation and demonstration of the robot boat monitoring platform at the National Council of Space Grant Directors meeting in February 2014. (note that the precision agriculture and robot boat projects that were part of the summer exchange program are also part of a year-round program at UMES, that were both supported by MDSGC, as a part of Research Infrastructure.)

Supporting Goal II, Objective #2, MDSGC supported internships both during the school year and during the summer. One student was supported to continue her research that was begun during a summer internships with a mentor at GSFC (originally as part of the Lunar and Planetary Science Academy at Goddard) on cratering on Mars and the Moon. MDSGC continued to conduct the Science Mission Directorate – Space Grant internship program, in which students serve internships at NASA SMD missions that are not housed at NASA Centers. It was a difficult year for these internships, since many Space Grants did not feel that they could commit funds, given the reduction in their overall funding and the uncertainty among the SMD missions about EPO spending during the period of time when internships were being considered. The Working Group resolved to make offers earlier next year, to increase the chances of making all the connections. It is worth noting that one of the interns at Chandra that was supported for two years by MDSGC is now working at the Chandra X-Ray Observatory.

Goal II, Objective #2 was also met by funding a proposal that, in part, supported a student at Towson University to work on science in support of geospatial technologies. The student worked with a mentor. In this project they developed a series of tutorials for the MultiSpec software, which were tested by 2 pre-service teachers at Towson University, and will be made available on the website. In addition, they created a series of Landsat 5 imagery for Maryland's 24 counties, which are accessible with the MultiSpec software. They created geospatial data sets for impervious surfaces, forest cover, and urban heat island effects for all the Maryland counties and will make these available on the web. They also updated the MarylandViewer website, which is a part of the national AmericaView program. This effort directly addresses the NASA Education Priority on Environmental Science and Global Climate Change.

A second program at Towson University also supports MDSGC Goal II, Objective #2. In this program a guidebook is developed to show teachers how to use a tethered balloon and a standard set of hardware and software to generate maps derived from inexpensive cameras aboard the kite platform. An undergraduate student is being hired to develop these tools and a workshop for approximately 35 in-service teachers in Maryland will be held to familiarize them with the project and to learn how to implement it at their school. We are reporting this under Higher Education in this report, since this is the bulk of the funding goes to the undergraduate student, though it clearly has a teacher professional development component. Note also that this student is not included in the report here of direct participants, as the project is just getting underway at the time of this report.

Meeting both Objectives #2 and #3 of Goal II is a project funded at Morgan State University. In this project, engineering students (both graduate and undergraduate) from Morgan State work with mentors at Morgan and NASA GSFC to conduct research on the maintainability of radomes that NASA operates in the Antarctic. One student used this project to satisfy his senior design requirement and has recently graduated.

Goal III concerns our support of Research Infrastructure. As described in our five-year proposal, as well as our Implementation Plan, MDSGC does not place strong emphasis on funding Research Infrastructure programs. This strategy is based on the unique characteristics of Maryland and the recommendations of our partners and advisory groups. Maryland has a huge amount of aerospace-related research and development going on in the state already, and the need to generate capacity to participate in NASA-related research is not a strong one. MDSGC could not make a significant contribution to this area in most cases. We have supported Research Infrastructure projects at our affiliate, the University of Maryland Eastern Shore. This institution, and HBCU, has been very successful in developing their engineering and aviation science capabilities. They recently received ABET certification for their engineering program and they have been successful in obtaining sizable grant funds from the USDA, based in part on pilot efforts funded by MDSGC. They work regularly with Wallops Flight Facility on a number of projects. UMES serves as an anchor for our efforts on the Eastern Shore. Two projects were funded during this past funding cycle. In one project a graduate student worked on development of sensor based algorithms for remote sensing in support of precision agriculture. In a second program an undergraduate student continued to develop, design, construct, and test a new version of the robot boat that is used for water quality sampling data acquisition in support of scientific studies of the Chesapeake Bay and Assateague waters. This student gave a very well-received report on this project at the National Council of Space Grant Directors meeting in 2014 February. This project is continuing, and will receive additional development during the Summer Exchange Program.

Outcome 2: *Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty:* (Discussion of achievements primarily focused on your Higher Education programs not discussed in Outcome 1 and your Precollege programs). *(Educate and Engage)*

A program to send students from Capitol College to the RockOn workshop during the summer achieved MDSGC Goal II, Objective #3. Capitol College is just developing the interest and capability to participate in sounding rocket work, and RockOn has proven to be a major method of engaging students and faculty. RockOn is a program jointly managed by NASA Wallops Flight Facility, Virginia Space Grant Consortium and Colorado Space Grant Consortium.

Goal II, Objective #3 was also met by a follow-on project by the Johns Hopkins University Rocketry Team (the Hopkinauts). These students completed a RockSat X payload that was launched and obtained data during the past summer. As a follow-on, these students have continued to work with mentors at JHU and the Applied Physics Lab

to design three scientific payloads that they hope to fly on commercial launch vehicles. The most notable addition is an upper atmosphere negative ion monitor. Two of the students visited the Mojave SpacePort to discuss flight opportunities with commercial launch vendors. The student lead on this project made a presentation about the team's work at the National Council of Space Grant Directors meeting in 2014 February.

Goal IV, Objectives #1 & #3 were met by supporting the Student Spaceflight Experiments Program conducted by our affiliate, the National Center for Earth and Space Science Education. In this program a school district commits to engaging at least 300 students in proposing an experiment to be flown aboard the International Space Station. The best proposal is selected from that school district and the students get a berth for their experiment. The system makes use of a standard Nanoracks experiment module. MDSGC has supported four of these projects in recent years. During this funding cycle, the Howard County Public School System flew their second payload. MDSGC has focused exclusively on middle school students. The Howard County Public School System had a large number of proposal teams compete, and fully immersed over 500 8th grade students across three middle schools. In addition, 20 middle school teachers were full engaged in the project. The experiments are due to launch in 2014 May.

Goal IV, Objective #2 has been met for many years, but this is the last year for the project. The final cohort of in-service teachers is completing their course work at Johns Hopkins University to obtain a certificate in Earth & Space Science teaching. MDSGC has had to terminate this project due to reduced funding levels, but the JHU College of Education has indicated that they intend to continue the program with their own funds. There are 9 teachers in the final cohort.

Outcome 3: *Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission:* (Achievements and progress of Informal Education programs). *(Engage and Inspire)*

Goal V was not met this year due to the lack of proposals of fundable quality. The Assistant Director is working with informal science venues, especially the Maryland Science Center to develop worthwhile concepts.

PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES

- **Student Data and Longitudinal Tracking:** Number of program student participants employed by NASA, aerospace contractors, universities, and other educational institutions; Number of undergraduate students who move on to advanced education in NASA-related disciplines; Number of underrepresented and underserved students participating.
  (Example: Student Data and Longitudinal Tracking: Total awards= 200; Fellowship/Scholarship= 120, Higher Education/Research Infrastructure= 80; 90 of

the total awards are underrepresented minority F/S funding; 10 students have accepted STEM positions in an aerospace industry, while 3 have graduated and are pursuing advanced STEM degrees.)

Student Data and Longitudinal Tracking: Total awards = 44; Fellowship/Scholarship = 43, Higher Education/Research Infrastructure = 1; 26 of the total award represent underrepresented minority F/S funding (59%). During the FY13 program year 4 students are pursuing advanced degrees in STEM disciplines, 1 accepted a STEM position at a NASA contractor, 16 accepted STEM positions in industry, 3 accepted STEM positions in academia, and 2 went on to positions in non-STEM disciplines. (92% in STEM-related higher degree or career.) The remaining students have not yet received the degree that they were pursuing while the received their Space Grant award.

Minority-Serving Institution Collaborations: Summarize interactions. Reference the names of projects with MSI collaborations.

Two of the nine institutions of higher learning that are affiliates of MDSGC, Morgan State University (MSU) and University of Maryland Eastern Shore (UMES), are HBCUs. As any affiliate, they are expected to, and do, participate actively in MDSGC activities and programs. They each provide a representative to the Program Committee, which advises on policy and program direction, reviews proposals for funding, develops new proposals for funding, and interacts with other institutions to broaden the MDSGC network. UMES has received numerous Research Infrastructure grants from MDSGC and serves our "anchor" for activities on the Maryland Eastern Shore (where they work regularly with Wallops Flight Facility). UMES has been very active in presenting these results at national conferences and increasing the exposure of Space Grant to a broader audience. MSU is one of the main participants in our Balloon Payload Program, where it is a regular part of their engineering curriculum. MSU also has ongoing research projects funded by MDSGC, where MSU students work with engineers at GSFC on systems engineering projects. In addition, both schools have representatives on the Scholarship Committee who recruit, select, and monitor students at their respective institutions. Each also provides a member of the Oversight Committee, which advises MDSGC about its overall performance and strategy. Both MSU and UMES participate in our Summer Exchange Program, where (typically two) students from each campus are sent to one of the other campuses for a summer internship in a NASA-related research project. The third participant in the exchange is University of Maryland College Park, which sends one student each to UMES and MSU. Each year, there is a research seminar where these students present their work. Note that both universities were partners in the successful MERIT proposal to the Space Grant Innovative Pilot in STEM Education CAN, with MSU being the lead institution.

- **NASA Education Priorities:** *Accomplishments related to the "Current Areas of Emphasis" stated in the 2010 Space Grant solicitation. Report on areas that apply to work proposed in your proposal and budget.*

- Authentic, hands-on student experiences in science and engineering disciplines – the incorporation of active participation by students in hands-on learning or practice with experiences rooted in NASA-related, STEM-focused questions and issues; the incorporation of real-life problem-solving and needs as the context for activities.

- Diversity of institutions, faculty, and student participants (gender, underrepresented, underserved).
  MDSGC has 12 affiliate members, two of which are minority serving institutions. In addition, three of the others, UMCP, UMBC, and Capitol College have substantial numbers of students who are from underrepresented groups. MDSGC has one community college and one military academy among its affiliates, as well as two of the nation's best known space science facilities (STScI and APL). Finally, the National Center for Earth and Space Science Education is a member. The university members range from very large (UMCP) to fairly small institutions such as Capitol College.

  The MDSGC has four people who work regularly on the staff (mostly part time). Of these four, two are female and one is Native American.

  59% of the student participants who were directly funded during this cycle were from underrepresented minorities. 27% were female.

- Engage middle school teachers in hands-on curriculum enhancement capabilities through exposure to NASA scientific and technical expertise. Capabilities for teachers to provide authentic, hands-on middle school student experiences in science and engineering disciplines (see above).
  As noted above, two projects funded this year specifically targeted middle school teachers in hands-on activities that enhanced their capabilities. These were the Towson University geospatial sciences program that included tethered balloon mapping, and the student experiments that will be sent to the International Space Station.

- Summer opportunities for secondary students on college campuses with the objective of increased enrollment in STEM disciplines or interest in STEM careers.
  MDSGC did not receive any proposals that fit this criterion.

- Community Colleges – develop new relationships as well as sustain and strengthen existing institutional relationships with community colleges.
  Hagerstown Community College has been an affiliate for many years. They are currently working to return to participation in the Balloon Payload Program. A new bridge program has been initiated, which places STEM students who have completed their first year in a summer internship at the

school to which they intend to transfer, in the department of their intended major. Hagerstown CC is also working with MDSGC to respond to the community college CAN that is currently open.

- Aeronautics research – research in traditional aeronautics disciplines; research in areas that are appropriate to NASA's unique capabilities; directly address the fundamental research needs of the Next Generation Air Transportation System (NextGen).

  MDSGC did not receive any proposals related to aeronautics disciplines this year.

- Environmental Science and Global Climate Change – research and activities to better understand Earth's environments.

  Three funded projects relate to this area

  - The geospatial science project at Towson University provides teachers and researchers data and tools to understand Landsat 5 data for Maryland, and apply it to such topics as impervious surfaces, forest cover, and urban heat islands.
  - The precision agriculture project at UMES, which uses aerial remote sensing to examine crops and process the imagery to produce information on crop yields, water usage, and pollution.
  - The robotic boat project collects water quality data in coastal areas such as the Assateague bay.

- Enhance the capacity of institutions to support innovative research infrastructure activities to enable early career faculty to focus their research toward NASA priorities.

  As detailed above, Research Infrastructure support is not a major priority for MDSGC due to the research environment that exists in the state of Maryland. The bulk of our research infrastructure programs have been at UMES, to support the development of their engineering and aviation sciences program.

IMPROVEMENTS MADE IN THE PAST YEAR

Succinctly *describe improvements and/or adjustments made last year that demonstrate significant change(s) within the consortium. The improvements and/or adjustments that brought about change may have been in management, resource allocation, project design, project evaluation, etc.*

Several changes were made in response to the Mid-Course Assessment. An Improvement Plan was submitted, and accepted, and a final report has also been submitted that indicates the changes that were successfully made. The first issue involved some discrepancies in data reporting. Those were cleared up and a revised report and student data tables were submitted. The second issue was about the number of participants that were served. This, in part, was resolved by the revised data tables,

which included a number of participants that had not been recorded. For 2013, a greater number of students will be reported than the number in the original report of 2011 activities, in spite of the reduced funding level. In addition, the Program Committee was apprised of the need to fund more participants per dollar and has taken that into account in its deliberations about which proposals to fund. Finally, there was an issue concerning the amount of administrative costs, given the reduced funding levels provided to MDSGC. The Improvement Plan included a model for reduced administrative costs that included significant reduction in the amounts spent on the Director (whose funding was reduced from 0.20 FTE to 0.05 FTE) and the Assistant Director (whose funding from NASA-supplied sources was reduced from 100% to 61%).

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

List the institutions that comprise the consortium; include the name, type of institution, key characteristics, and role.

The **Johns Hopkins University** is the Lead Institution for MDSGC. The MDSGC offices are located on the Homewood Campus. The Director and Assistant Director work at this location. JHU is one of the premiere research institutions in the country. JHU receives scholarship funds from MDSGC and contributes a representative to the Scholarship Committee, as well as two members of the Oversight Committee (one from Arts & Sciences and one from Engineering).

Capitol College is an affiliate member of MDSGC. They are a four-year institution with both undergraduate and graduate programs. They have well-known specialties in spacecraft operations, robotics, and cyber security. Capitol College provides active members in the Program Committee and Oversight Committee. Capitol College receives scholarship funds and contributes a member to the Scholarship Committee. Capitol College is an active participant in the Balloon Payload Program. It is also one of the participants in the MERIT Program.

Hagerstown Community College is a two-year community college located in the Western Maryland Panhandle. It has representatives that actively participate in the Program Committee and the Oversight Committee. Scholarship funds for HCC are spent on a bridge program that takes HCC students and places them in internships at four-year colleges that are affiliates of MDSGC. HCC hosts the Girls in Engineering Program during the summer.

Johns Hopkins University **Applied Physics Laboratory** is a research institution affiliated with JHU. Major NASA missions such as MESSENGER and New Horizons have been developed and built at this facility. APL contributes active members to the Program Committee and the Oversight Committee.

Morgan State University is a charter member of MDSGC and therefore one of the oldest affiliates of Space Grant. It is a historically black university. It is an active participant in MDSGC programs and contributes members to the Oversight, Program and

Scholarship Committees. It is one of the participants in the Balloon Payload Program and the Principal Investigator for the MERIT program is at Morgan. Morgan State is also one of the participants in the Summer Student Exchange Program

National Center for Earth & Space Science Education is a national institution that has its headquarters in Maryland. Its purpose is to promote hands-on, real world experience for students and teachers that engage them in earth and space science. NCESSE provides a member for the Oversight and Program Committee. Through its many partnerships NCESSE has provided the access for many students, including Maryland students supported by MDSGC, to send experiments to the International Space Station.

Space Telescope Science Institute is a research institute that conducts the science operations for the Hubble Space Telescope and the James Webb Space Telescope. They conduct one of NASA's premiere education and public outreach programs. STScI is very active in all MDSGC programs and has representatives on the Program and Oversight Committees.

Towson University is a four-year educational institution for both undergraduate and graduate students. The Program Committee representative from Towson is also the leader of the MarylandView portion of AmericaView, a key project for using satellite remote sensing data for practical applications. Towson is also the home of the Maryland Project Astro, which was started with seed money from MDSGC.

United States Naval Academy is the military academy for the United States Navy. It provides undergraduate training in STEM fields to its students. The Academy has a representative on the Program and Oversight Committees. It does not receive scholarship funds, as they are not needed at that institution.

University of Maryland Baltimore County is a four-year university with both undergraduate and graduate degree programs. It receives scholarship funds and has a representative on the Scholarship Committee. In addition, it has people who serve on the Program Committee and the Oversight Committee. UMBC is a part of the MERIT Program.

University of Maryland College Park is the flagship of the University of Maryland system. It is a four-year university with both undergraduate and graduate degree programs. It provides representatives to the Program and Oversight Committee. Due to the large size of UMCP it has a more extensive participation in the Scholarship Committee, with a member or two from the College of Arts and Sciences, and two members from the Center for Minorities in Science and Education. UMCP participates in the Summer Student Exchange Program, the MERIT Program, and is the lead in the Balloon Payload Program.

University of Maryland Eastern Shore is a four-year university with undergraduate and graduate degree programs. It is an historically black university. UMES contributes members to the Oversight, Program and Scholarship Committees. UMES is a participant

in the Summer Student Exchange Program. It is a part of the MERIT program. UMES has conducted programs that support remote sensing in support of precision agriculture and robotic water quality data collection.

The National Space Grant Office requires two annual reports, the Annual Performance Data Report (APD) and the Office of Education Performance Measurement System (OEPM) report. The former is primarily narrative and the latter data intensive. Because the reporting timeline cycles are different, data in the two reports may not necessarily agree at the time of report submission. OEPM data are used for official reporting.